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Identifying the Dimensions of an Effective Classroom Management Model Based on Technological Approaches for Physical Education Students at Wasit University

Sadeq. Kadhim Awad Algharani[1], Nima. Shahidi[2*], Intisar. Kadhim Khamees[3], Ali Rashidpoor[4]

[1] Ph.D. student, Department of Educational Management, Isf.C., Islamic Azad University, Isfahan, Iran
[2] Department of Educational Management, NoM.C., Islamic Azad University, Shiraz, Iran
[3] Assistant Professor, Department of Educational Management, Wasit University, Wasit, Iraq
[4] Department of Management, Isf.C., Islamic Azad University, Isfahan, Iran

*** Corresponding author email address**: Nima.shahidi@iau.ac.ir

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A B S T R A C T

Purpose: The aim of this study was to identify the dimensions of an effective classroom management model based on technological approaches for physical education students at Wasit University.

Methods and Materials: This study was conducted using a qualitative descriptive–exploratory approach. The participants consisted of 17 university experts, faculty members, and specialists in educational management and physical education who were selected through purposive sampling based on theoretical saturation. Data were collected using semi-structured interviews lasting between 30 and 80 minutes. The interview questions focused on blended learning, technological infrastructure, teacher–student interaction, digital assessment, student participation, classroom organization, learning analytics, and ethical considerations in educational technology. The interviews were transcribed and analyzed using thematic analysis with MAXQDA 2020 software. To ensure trustworthiness and credibility, techniques such as expert review, participant feedback, and validation of extracted themes by specialists were applied.

Findings: The qualitative analysis resulted in the identification of eight major dimensions of effective classroom management based on technological approaches. These dimensions included blended learning and online education, technological infrastructure and tools, technological teacher–student interaction, electronic assessment and feedback, facilitation of active student participation, time management and classroom organization, monitoring and analysis of learning data, and security and ethics in technology use. The findings indicated that blended learning and instructional videos improved students' preparation before practical classes and reduced learning stress. Technological tools such as smart boards, educational applications, and learning management systems enhanced practical learning quality and classroom efficiency. Digital interaction platforms increased communication, collaboration, and participation among students and instructors. Electronic assessment and immediate feedback contributed to better performance correction and instructional effectiveness. The results also showed that gamification, collaborative digital activities, and multimedia tools enhanced student motivation, creativity, and engagement. In addition, learning analytics and digital monitoring

systems facilitated individualized educational support, while ethical and privacy considerations were identified as essential components of technology-oriented classroom management.

Conclusion: The findings demonstrated that effective classroom management based on technological approaches is a multidimensional and integrated educational system that combines instructional technology, interactive learning, digital organization, feedback systems, data-driven monitoring, and ethical responsibility. The identified model highlights the importance of integrating technological infrastructure with pedagogical, communicative, and managerial competencies in order to improve the quality of physical education instruction at the university level.

Keywords: *Classroom Management, Educational Technology, Physical Education, Blended Learning, Technological Interaction, Electronic Assessment, Student Participation, Learning Analytics*

1. Introduction

Classroom management has long been recognized as one of the most fundamental components of effective teaching and successful learning environments. In contemporary educational systems, the concept of classroom management has evolved beyond traditional disciplinary approaches and now encompasses a broad range of pedagogical, psychological, technological, and organizational dimensions. Effective classroom management refers to the ability of educators to establish productive learning environments, maintain student engagement, facilitate interaction, organize educational processes, and promote positive learning outcomes through strategic instructional practices. In recent years, rapid technological developments and the expansion of digital learning environments have transformed the nature of classroom management, particularly in higher education settings where blended learning, online instruction, and digital communication tools increasingly shape teaching and learning processes (Abidin, 2024; Sinclair, 2024).

The integration of technology into classroom management has become especially important in university education because digital tools can support communication, instructional delivery, student participation, assessment, and learning analytics simultaneously. Modern classrooms increasingly rely on technological infrastructures such as learning management systems, smart boards, multimedia applications, online collaboration platforms, and digital feedback systems to improve instructional effectiveness and student engagement. These transformations have shifted the role of instructors from information transmitters toward facilitators of interactive and technology-enhanced learning experiences. Consequently, effective classroom management in technologically enriched educational environments requires instructors to possess not only pedagogical knowledge but also technological competence and adaptive instructional strategies (Farooq, 2025; Zhang, 2024).

One of the major educational changes associated with technological advancement is the development of blended learning and flipped classroom models. These approaches combine traditional face-to-face instruction with digital learning opportunities, enabling students to engage with educational materials before, during, and after class sessions. Studies have demonstrated that flipped and blended learning models improve students' participation, independent learning, motivation, and academic achievement. Furthermore, these approaches provide greater flexibility in instructional organization and create opportunities for interactive learning experiences that enhance classroom effectiveness (Gholami et al., 2023; Rizos et al., 2023; Sopamena et al., 2023). In physical education contexts, the use of instructional videos, digital demonstrations, and online practice materials may further support skill acquisition and improve students' practical performance.

The growing use of digital educational technologies has also changed the dynamics of teacher–student interaction. Traditional communication patterns have gradually expanded into digital spaces where messaging applications, online discussion platforms, learning management systems, and collaborative digital tools facilitate continuous interaction between instructors and students. Technology-based interaction enables students to participate more actively in discussions, receive immediate feedback, and collaborate with peers more effectively. Such interactions are particularly important for students who may hesitate to participate in conventional classroom settings. Research has shown that interactive digital communication positively affects student engagement, learning motivation, and classroom climate (Kadagidze, 2024; Nnko, 2024).

Another important dimension of effective classroom management concerns student participation and motivation. Maintaining active engagement in classroom activities remains one of the central challenges faced by educators,

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especially in university environments characterized by diverse student abilities and learning preferences. Technological approaches such as gamification, collaborative digital learning, multimedia content, and interactive online activities have emerged as effective strategies for increasing student motivation and participation. These methods encourage students to become more involved in learning activities and support the development of creativity, teamwork, and critical thinking skills. Research findings indicate that active learning environments supported by technology significantly contribute to students' behavioral engagement and classroom participation (Shahzadi et al., 2024; Wang et al., 2024; Xu et al., 2023).

In addition to enhancing participation, technology-based classroom management also contributes to differentiated instruction and individualized learning support. Modern educational technologies enable instructors to adapt instructional content, assessment methods, and learning activities according to students' needs, abilities, and learning styles. Differentiated instruction is especially important in mixed-ability classrooms because students often possess varying levels of prior knowledge, motivation, and academic readiness. Technological tools facilitate flexible instructional planning and provide opportunities for individualized feedback and adaptive learning experiences (Patel & Kim, 2024). Such flexibility may be particularly beneficial in physical education programs where students differ in practical abilities, physical skills, and learning preferences.

The role of emotional and psychological factors in classroom management has also attracted increasing scholarly attention. Effective classroom management is closely associated with teachers' emotional intelligence, communication skills, leadership abilities, and psychological readiness to manage complex learning environments. Teachers who demonstrate emotional awareness, empathy, and effective communication strategies are more capable of establishing supportive classroom climates and maintaining positive relationships with students. Emotional intelligence contributes significantly to classroom harmony, conflict management, student motivation, and instructional effectiveness (Baghel et al., 2025; Reynolds et al., 2023). In technologically enhanced classrooms, instructors must also demonstrate psychological readiness to integrate digital technologies effectively while maintaining pedagogical balance and student-centered learning environments (Farooq, 2025).

The emergence of artificial intelligence and advanced educational technologies has further expanded the scope of classroom management. AI-supported learning systems, intelligent tutoring platforms, automated feedback systems, and learning analytics tools increasingly influence educational decision-making and instructional management processes. AI literacy and instructors' readiness for technology integration have therefore become essential competencies for modern educators. Research has indicated that teachers' psychological readiness and technological self-efficacy significantly influence the successful integration of AI and digital technologies into classroom practices (Farooq, 2025; Zhang, 2024). Such developments emphasize the need to conceptualize classroom management within broader technological and digital frameworks.

Despite the increasing importance of technology in educational settings, effective classroom management remains a complex and multidimensional phenomenon. Classroom management involves not only instructional organization and discipline but also communication, emotional regulation, collaborative learning, assessment, time management, and ethical considerations. Technology can improve these dimensions when appropriately integrated; however, ineffective technological implementation may also create challenges related to distraction, unequal access, technical problems, privacy concerns, and reduced interpersonal communication. Consequently, the effectiveness of technological approaches in classroom management depends largely on how educational technologies are integrated into pedagogical practices and institutional contexts (Purwandoko, 2023; Sinclair, 2024).

In physical education classrooms, classroom management presents additional complexities because instruction often combines theoretical learning with practical physical activities. Physical education instructors must simultaneously manage space, time, movement, equipment, student safety, and active participation. The integration of technological approaches in such settings may support instructional efficiency, skill demonstration, student monitoring, and collaborative learning. For example, smart boards, instructional videos, wearable technologies, motion analysis software, and online learning platforms can improve both theoretical understanding and practical skill acquisition. Nevertheless, the successful implementation of these technologies requires effective planning, organizational skills, and technological infrastructure (Carter, 2024; Jayathissa, 2023).

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Research also highlights the significance of evidence-based teaching practices in establishing productive learning environments. Effective classroom management is closely associated with instructional clarity, classroom organization, student-centered teaching, formative assessment, and collaborative learning opportunities. Technology can strengthen these practices by facilitating instructional accessibility, supporting continuous assessment, and enabling interactive communication among learners and instructors (Carter, 2024). Moreover, technology-supported learning environments often encourage critical thinking, problem-solving, and collaborative learning processes that contribute to deeper educational experiences (Wang et al., 2024; Xu et al., 2023).

Another critical aspect of technology-based classroom management concerns monitoring and evaluation processes. Digital educational systems provide instructors with access to learning analytics, performance dashboards, online assessment data, and student participation records. These tools enable instructors to identify students' strengths and weaknesses, monitor learning progression, and provide timely feedback. Such analytical capabilities support data-driven educational decision-making and improve instructional responsiveness. Furthermore, online assessment systems and digital feedback mechanisms facilitate rapid communication between instructors and students, thereby enhancing learning efficiency and classroom organization (Abidin, 2024; Patel & Kim, 2024).

At the same time, ethical and security considerations have become increasingly important in digital learning environments. The use of educational technologies requires attention to digital rights, intellectual property, privacy protection, and information security. Instructors and educational institutions must ensure that technological practices comply with ethical standards and protect students' personal information. Concerns related to digital safety, online behavior, and data protection are therefore essential components of effective classroom management in technology-based educational contexts (Kadagidze, 2024; Nnko, 2024).

Previous studies have explored different dimensions of classroom management, technological integration, blended learning, student participation, and digital instruction. However, relatively limited attention has been paid to identifying a comprehensive model of effective classroom management based on technological approaches specifically within physical education programs in higher education institutions. Most previous research has focused on general classroom settings or isolated technological strategies rather than examining the integrated dimensions of technology-oriented classroom management in physical education environments. Additionally, the contextual conditions of Iraqi universities and the educational experiences of physical education students at Wasit University remain underexplored in the literature.

Given the increasing reliance on digital educational technologies, the need for effective technology-oriented classroom management models has become more significant than ever. Identifying the dimensions and components of such models may contribute to improving teaching quality, student participation, educational interaction, and organizational effectiveness in university classrooms. Furthermore, understanding how technological approaches influence classroom management can provide practical guidance for instructors, curriculum designers, and educational policymakers seeking to enhance teaching and learning experiences in higher education environments.

Therefore, the aim of the present study was to identify the dimensions of an effective classroom management model based on technological approaches for physical education students at Wasit University.

2. Methods and Materials

2.1. Study Design and Participants

This study was conducted using a qualitative descriptive–exploratory design. Since the main purpose of the study was to identify the dimensions of an effective classroom management model based on technological approaches for physical education students at Wasit University, the qualitative approach was considered appropriate because it allowed the researcher to explore expert experiences, perceptions, and interpretations in depth. The participants were selected through purposive sampling based on their expertise, experience, and familiarity with classroom management, educational technology, physical education, and university teaching. The key participants included university faculty members, educational management specialists, physical education instructors, and experts familiar with technology-based teaching environments. The interviews continued until theoretical saturation was achieved; although saturation was reached after the fifteenth interview, two additional interviews were conducted to ensure data adequacy and conceptual richness. In total, 17 experts participated in the qualitative phase. The interviews lasted between 30 and 80 minutes. Before each interview,

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the purpose of the research, confidentiality of information, voluntary participation, and ethical considerations were explained to the participants. Among the participants, 12 were male and 5 were female. In terms of professional experience, 7 participants had 10 to 15 years of experience, 9 participants had 16 to 30 years of experience, and 1 participant was a retired expert. Regarding educational level, 3 participants held a master's degree and 14 participants held a doctoral degree.

2.2. Data Collection Tools

The main data collection tool in this study was a semi-structured interview. The interview questions were developed based on the research objectives, theoretical foundations, and previous studies related to effective classroom management, technological approaches in education, and the specific requirements of physical education classes. Semi-structured interviews were used because they provided a flexible framework for asking similar core questions from all participants while allowing them to elaborate on their views, experiences, and suggestions. The main interview questions focused on participants' experiences with technological tools such as projectors, smart boards, educational applications, learning management platforms, blended learning, online feedback, electronic assessment, teacher–student technological interaction, digital classroom organization, student participation through technology, learning analytics, and ethical and security considerations in technology use. Some interviews were conducted face to face, while in some cases initial written responses were received and then followed by deeper virtual interviews. The interviews were recorded with the participants' consent and then transcribed verbatim. The researcher also used field notes during and immediately after the interviews to record contextual observations and analytical reflections.

2.3. Data Analysis

The qualitative data were analyzed using thematic analysis with the support of MAXQDA 2020 software. After transcription, the interview texts were imported into the software and reviewed several times to achieve immersion in the data. In the first stage, initial codes were extracted from meaningful units of the interview texts. Then, similar and related codes were compared, merged, and organized into basic themes. In the next stage, the basic themes were classified according to conceptual similarity and difference, leading to the formation of organizing themes. Finally, the organizing themes were integrated into broader global themes representing the main dimensions of the effective classroom management model based on technological approaches. The analysis resulted in the identification of major dimensions such as blended learning and online education, technological infrastructure and tools, technological teacher–student interaction, electronic assessment and feedback, facilitation of active student participation, time management and classroom organization, monitoring and analysis of learning data, and security and ethics in the use of technology. To ensure the credibility and trustworthiness of the findings, qualitative validation strategies were used, including expert review, participant feedback, researcher self-review, and comparison of interview findings with theoretical and empirical literature. A summary of the extracted codes and themes was sent to 10 participants and relevant experts, and their comments were used to refine and confirm the final thematic framework.

3. Findings and Results

In the qualitative phase of the study, the interview data obtained from experts and university specialists were analyzed through thematic analysis using MAXQDA 2020 software. Following the processes of coding, categorization, and conceptual integration, the extracted concepts were organized into primary concepts, subthemes, and main themes associated with effective classroom management based on technological approaches for physical education students at Wasit University. The findings demonstrated that technology-oriented classroom management is a multidimensional construct involving educational, interactive, organizational, evaluative, analytical, and ethical dimensions. Table 1 presents the identified initial concepts and their formulation into primary categories.

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Table 1

Identified Initial Concepts and Their Formulation into Primary Categories

Row	Extracted Statement	Subtheme
1	Reviewing concepts before class	Student preparation and pre-class review
2	Better student readiness before class	Student preparation and pre-class review
3	Reduced stress before class	Student preparation and pre-class review
4	Reviewing content before class	Student preparation and pre-class review
5	Combining face-to-face and online education	Online blended learning and feedback
6	Recording and sharing instructional videos	Online blended learning and feedback
7	Student interaction with content	Online blended learning and feedback
8	Learning from group digital feedback	Online blended learning and feedback
9	Using videos to review movements	Online blended learning and feedback
10	Observing exercise performance through videos	Online blended learning and feedback
11	Reviewing educational content before class	Online blended learning and feedback
12	Using training videos	Online blended learning and feedback
13	Watching practical videos	Online blended learning and feedback
14	Faster learning of movements	Improving learning through smart boards
15	Accurate correction of movements	Improving learning through smart boards
16	Better practice before class	Improving learning through smart boards
17	Improved quality of practical classes	Improving learning through smart boards
18	Observation and practical training in class	Improving learning through smart boards
19	Pre-class background preparation	Pre-class instructional videos
20	Optimal use of practical classes	Pre-class instructional videos
21	Video observation and practice	Pre-class instructional videos
22	Internet disruption and reduced educational quality	Access to equipment and internet
23	Preparing exercises with digital equipment	Access to equipment and internet
24	Better use of practical classes	Improving practical classes and tools
25	Practical class quality and practical exercises	Improving practical classes and tools
26	Using educational software	Specialized software and applications
27	Practicing movements with applications	Specialized software and applications
28	Recording performance through software	Specialized software and applications
29	Using LMS for assignment submission	Learning management platforms
30	Monitoring student progress in LMS	Learning management platforms
31	Student interaction with content anytime	Learning management platforms
32	Easy interaction with instructors	Technological teacher–student interaction
33	Active participation of shy students	Technological teacher–student interaction
34	Receiving responses from classmates	Technological teacher–student interaction
35	Interactive learning from classmates	Interactive group learning
36	Viewing classmates' responses	Interactive group learning
37	Using classmates' experiences	Interactive group learning
38	Using social networks for Q&A	Digital interaction and classroom synergy
39	Fast instructor response through messaging apps	Digital interaction and classroom synergy
40	Online polling in class	Digital interaction and classroom synergy
41	Interaction with instructors through LMS	Digital interaction and classroom synergy
42	Discussion and exchange in educational groups	Digital interaction and classroom synergy
43	Using online voting tools	Digital interaction and classroom synergy
44	Online interaction with instructors and classmates	Digital interaction and classroom synergy
45	Participation in online group discussions	Digital interaction and classroom synergy
46	Rapid correction of mistakes	Immediate feedback and instructor presence
47	Identifying mistakes	Immediate feedback and instructor presence
48	Feeling instructor support	Immediate feedback and instructor presence
49	Providing immediate group feedback	Immediate feedback and instructor presence
50	Sense of instructor presence	Immediate feedback and instructor presence
51	Designing online intelligent exams	Online assessment and feedback
52	Providing immediate digital feedback	Online assessment and feedback
53	Using self-assessment platforms	Online assessment and feedback
54	Fast group feedback	Online assessment and feedback
55	Online personal feedback	Online assessment and feedback
56	Designing interactive tests	Online assessment and feedback

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57	Immediate group feedback delivery	Online assessment and feedback
58	Motivation and healthy competition	Gamification and motivation
59	Active participation of passive students	Gamification and motivation
60	Increased student motivation	Gamification and motivation
61	Challenges and group competition	Gamification and motivation
62	Increased group creativity	Group activities and creativity
63	Innovative idea generation	Group activities and creativity
64	Attractiveness of group activities	Group activities and creativity
65	Purposeful group activity	Group activities and creativity
66	Designing group activities using Padlet	Digital group activities
67	Using Jamboard for collaboration	Digital group activities
68	Using multimedia content	Digital group activities
69	Using animations for attractiveness	Digital group activities
70	Designing interactive group activities	Digital group activities
71	Using animations and images	Digital group activities
72	Designing group activities with digital content	Digital group activities
73	Using visual content for class	Digital group activities
74	Using animations and videos	Digital group activities
75	Timely implementation of exercises	Student commitment and task management
76	Session order and scheduling	Student commitment and task management
77	Accurate exercise scheduling	Student commitment and task management
78	Accurate and organized practice	Student commitment and task management
79	Student responsibility	Planning and organization
80	Smart scheduling using digital calendars	Planning and organization
81	Assignment reminders through applications	Planning and organization
82	Using timers for classroom activities	Planning and organization
83	Assignment reminders through apps	Planning and organization
84	Smart planning through applications	Planning and organization
85	Monitoring student performance data	Individual student monitoring and analysis
86	Identifying student strengths and weaknesses	Individual student monitoring and analysis
87	Tracking individual progress through dashboards	Individual student monitoring and analysis
88	Identifying individual mistakes	Individual student monitoring and analysis
89	Individual performance analysis	Individual student monitoring and analysis
90	Using analytical dashboards for progress	Group and practical monitoring and analysis
91	Group data analysis	Group and practical monitoring and analysis
92	Group performance analysis	Group and practical monitoring and analysis
93	Identifying weaknesses and strengths	Group and practical monitoring and analysis
94	Monitoring and correcting weaknesses	Group and practical monitoring and analysis
95	Analysis of practical abilities	Group and practical monitoring and analysis
96	Teaching ethical principles in digital spaces	Digital rights and copyright
97	Familiarity with intellectual property and copyright	Digital rights and copyright
98	Digital rights education	Digital rights and copyright
99	Maintaining privacy in online educational environments	Privacy and information protection
100	Protection of personal information	Privacy and information protection
101	Security and privacy in online classes	Privacy and information protection
102	Protecting student information in LMS systems	Privacy and information protection

The findings presented in Table 1 indicate that the extracted concepts covered a broad range of educational and technological experiences related to classroom management in physical education. The identified concepts reflected both instructional and managerial dimensions of technology integration in university classrooms. Participants emphasized that technological tools improved student preparation before class, enhanced interaction and communication, increased motivation and engagement, and facilitated assessment and monitoring processes. Furthermore, several extracted concepts highlighted the importance of ethical considerations, digital security, and privacy protection within technology-based learning environments.

The analysis also showed that technological approaches were not limited to the use of digital tools alone, but rather represented a comprehensive framework involving blended learning, collaborative interaction, learning analytics, classroom organization, and digital responsibility. The diversity of the extracted statements demonstrated that

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effective classroom management in physical education requires simultaneous attention to instructional quality, student participation, technological infrastructure, and data-driven educational decision-making.

In the next stage of analysis, the primary concepts and subthemes were integrated into broader main themes in order to identify the major dimensions of the effective classroom management model based on technological approaches. Table 2 presents the organization of the subthemes into the final main themes extracted from the qualitative analysis.

Table 2

Organization of Subthemes and Identification of Main Themes

Main Theme	Subthemes	Number of Concepts
Blended Learning and Online Education	Student preparation and pre-class review; Online blended learning and feedback	13
Technological Infrastructure and Tools	Smart boards; Pre-class instructional videos; Internet and equipment access; Practical class tools; Specialized applications; Learning management systems	18
Technological Teacher–Student Interaction	Teacher–student interaction; Interactive group learning; Digital classroom synergy	14
Electronic Assessment and Feedback	Immediate feedback and instructor presence; Online assessment and feedback	12
Facilitating Active Student Participation	Gamification and motivation; Group creativity; Digital group activities	17
Time Management and Classroom Organization	Student task commitment; Planning and organization	10
Monitoring and Analysis of Learning Data	Individual monitoring and analysis; Group and practical analysis	11
Security and Ethics in Technology Use	Digital rights and copyright; Privacy and information protection	7

The results presented in Table 2 demonstrate that the qualitative analysis led to the extraction of eight major dimensions underlying effective classroom management based on technological approaches. Among these dimensions, technological infrastructure and tools, facilitation of active student participation, and technological interaction between instructors and students contained the largest number of concepts, indicating their central importance in the experiences and perceptions of participants. The findings suggest that technology-based classroom management in physical education is strongly dependent on interactive learning environments, digital communication, and the availability of appropriate technological facilities.

The findings further indicate that blended learning and online education were perceived as important mechanisms for improving students' readiness, reducing classroom stress, and supporting continuous learning outside the classroom environment. Participants repeatedly emphasized the value of instructional videos, smart educational tools, and online learning platforms in increasing the quality of practical training sessions and improving classroom efficiency.

Another important finding was related to monitoring and analysis of learning data. Participants believed that digital dashboards and analytical tools could assist instructors in identifying students' strengths and weaknesses, monitoring performance progression, and providing individualized feedback. Additionally, ethical and security dimensions emerged as critical components of technology-oriented classroom management. Participants stressed the importance of maintaining digital privacy, protecting student information, and respecting copyright and intellectual property rights within online educational settings.

Overall, the findings revealed that effective classroom management based on technological approaches in physical education is a multidimensional and integrated system that combines educational technology, interactive learning, digital organization, assessment processes, analytical monitoring, and ethical responsibility within the university learning environment.

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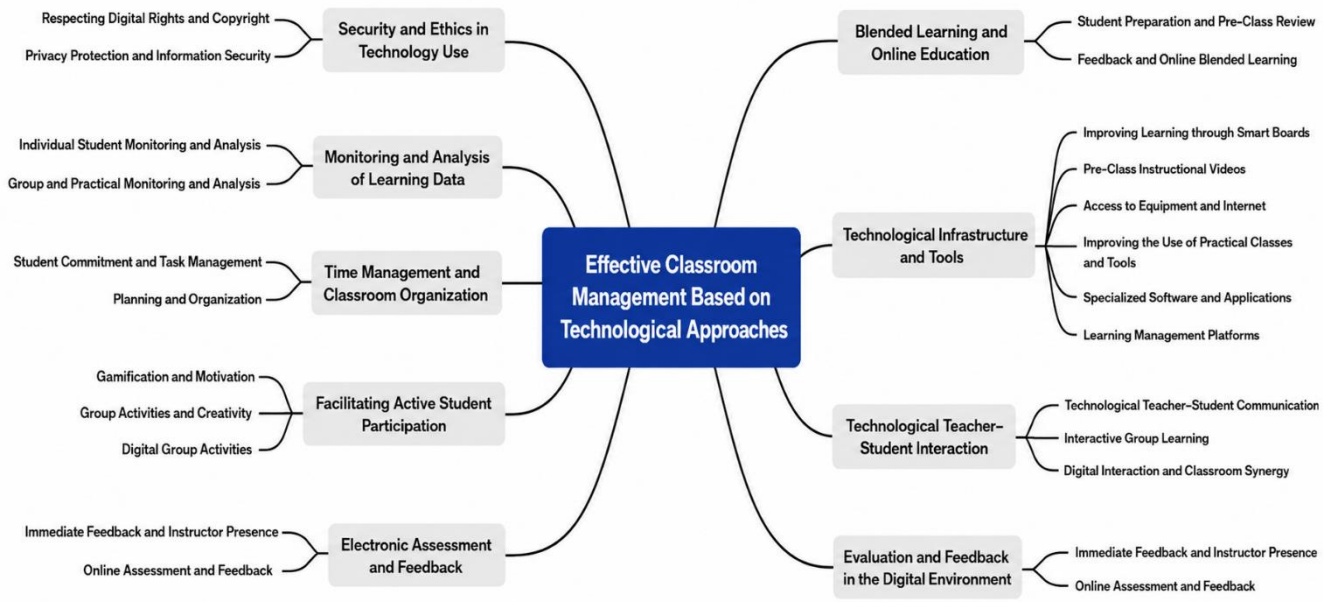
Figure 1

Final Model



4. Discussion and Conclusion

The present study aimed to identify the dimensions of an effective classroom management model based on technological approaches for physical education students at Wasit University. The findings of the qualitative analysis demonstrated that effective technology-oriented classroom management is a multidimensional construct consisting of blended learning and online education, technological infrastructure and tools, technological teacher–student interaction, electronic assessment and feedback, facilitation of active student participation, time management and classroom organization, monitoring and analysis of learning data, and security and ethics in technology use. These findings indicate that classroom management in contemporary higher education environments can no longer be understood only in terms of behavioral control or instructional discipline; rather, it represents a comprehensive educational ecosystem in which technology, interaction, organization, participation, and evaluation are integrated into the teaching and learning process.

One of the major findings of the study was the importance of blended learning and online education as a central dimension of effective classroom management. Participants emphasized that reviewing educational content before class, using instructional videos, and combining online and face-to-face instruction improved students' readiness and reduced anxiety before practical sessions. This finding aligns with studies examining the effectiveness of flipped and blended learning models. Sopamena and colleagues reported that the flipped classroom model enhances learning achievement by allowing students to engage with educational content before class and participate more actively during classroom activities (Sopamena et al., 2023). Similarly, Rizos and colleagues found that the flipped classroom model improved engagement and learning effectiveness in mathematics education courses (Rizos et al., 2023). Gholami and colleagues also demonstrated the effectiveness of flipped classroom biology instruction in improving learning experiences among students (Gholami et al., 2023). The present findings extend these conclusions to physical education by showing that pre-class exposure to digital instructional content enables students to enter practical classes with greater cognitive preparedness and confidence, thereby improving classroom efficiency and reducing passive learning behaviors.

The findings also highlighted the significant role of technological infrastructure and digital tools in effective classroom management. Participants repeatedly referred to the importance of smart boards, instructional videos, learning management systems, internet access, and specialized educational applications in improving classroom quality and practical learning. These findings support the

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growing literature emphasizing that technological effectiveness depends not only on pedagogy but also on infrastructure and accessibility. Farooq argues that successful integration of artificial intelligence and digital technologies in classrooms requires both psychological readiness and supportive technological environments (Farooq, 2025). Likewise, Zhang emphasizes that contemporary classrooms increasingly require structured technological literacy and integration strategies (Zhang, 2024). The present study confirms that in physical education settings, technological infrastructure plays an especially important role because practical and movement-based learning often depends on visual demonstration, video analysis, and interactive applications. Participants indicated that technological tools improved observation of movements, supported correction of practical errors, and optimized the use of limited classroom time.

Another important finding was the role of technological interaction between instructors and students. Participants emphasized that digital communication platforms, social networks, LMS systems, and online discussion tools increased accessibility to instructors, encouraged shy students to participate, and strengthened collaborative learning. This finding is consistent with previous studies highlighting the importance of communication and interaction in educational effectiveness. Nnko demonstrated that communication patterns significantly affect classroom teaching effectiveness (Nnko, 2024). Kadagidze further explained that emotional intelligence and communication skills are essential for effective online teaching and interaction (Kadagidze, 2024). In the current study, technology was viewed not merely as a content-delivery mechanism but as a communication bridge that expanded interaction beyond classroom boundaries. The findings suggest that digital interaction can strengthen classroom management by facilitating rapid communication, increasing participation opportunities, and supporting collaborative learning experiences. Particularly in physical education, where students may hesitate to ask questions publicly or may require continuous clarification regarding exercises and techniques, technology-based interaction can provide more accessible and less stressful communication channels.

The study also identified electronic assessment and feedback as a critical dimension of effective classroom management. Participants highlighted the importance of immediate digital feedback, online assessments, interactive testing, and self-evaluation platforms in improving learning and correcting mistakes. These findings align with evidence indicating that continuous and timely feedback improves learning effectiveness and classroom organization. Carter and colleagues emphasize that evidence-based teaching practices involve structured instructional strategies and feedback systems that guide student learning effectively (Carter, 2024). Similarly, Jayathissa's findings on performance-based evaluation suggest that structured assessment processes improve students' educational performance and engagement (Jayathissa, 2023). In physical education contexts, immediate feedback is particularly important because students often need rapid correction of physical movements and performance techniques. The present findings suggest that digital feedback systems enhance classroom management by enabling instructors to provide faster, clearer, and more individualized responses to student performance.

Facilitating active student participation emerged as another major dimension of the identified model. Participants emphasized that gamification, digital group activities, multimedia content, and collaborative online tasks increased student motivation, creativity, and engagement. This finding strongly corresponds with research emphasizing the role of active learning and collaborative educational strategies. Wang and colleagues found that critical thinking workshops improved creativity and classroom behavior (Wang et al., 2024). Xu and colleagues also demonstrated that collaborative problem-solving strategies significantly promote students' critical thinking abilities (Xu et al., 2023). Additionally, Shahzadi and colleagues reported that brain-based classroom strategies increase learning effectiveness and participation (Shahzadi et al., 2024). The present findings support these perspectives by showing that technological tools can transform students from passive recipients into active participants in the learning process. Digital platforms, collaborative applications, animations, multimedia content, and gamified activities created more attractive and engaging educational environments that increased participation even among less active students.

The findings related to time management and classroom organization also deserve attention. Participants noted that digital calendars, reminders, scheduling applications, and task-management tools improved students' responsibility, classroom order, and adherence to practical exercises. This finding supports the broader understanding of classroom management as an organizational and leadership process. Purwandoko argues that effective classroom management is

associated with leadership-oriented classroom practices that structure activities and improve educational organization (Purwandoko, 2023). Likewise, Sinclair emphasizes that teachers require practical management strategies to maintain effective classroom organization (Sinclair, 2024). In physical education classes, where practical sessions require coordination, timing, and organization of activities, technological scheduling and reminder systems appear particularly valuable. The findings suggest that digital organizational tools can reduce confusion, improve discipline, and help instructors manage practical activities more efficiently.

Another significant finding was the importance of monitoring and analysis of learning data. Participants believed that analytical dashboards and digital monitoring systems enabled instructors to identify students' strengths and weaknesses, track progress, and analyze individual and group performance more effectively. This finding reflects the increasing role of data-driven educational decision-making in modern classrooms. Technology-based monitoring systems allow instructors to move beyond subjective judgments and use systematic information to guide instruction and feedback. Such practices are especially important in physical education because students' progress often involves gradual improvement in practical skills and physical performance. The ability to monitor individual development over time may enhance both instructional accuracy and motivational support.

The study also revealed that ethical and security considerations constitute an essential dimension of effective technology-based classroom management. Participants emphasized the importance of privacy protection, digital rights education, copyright awareness, and protection of personal information within LMS systems and online educational environments. This finding demonstrates that technology integration cannot be separated from ethical responsibility. As classrooms increasingly rely on digital platforms, concerns regarding information security, student privacy, and ethical use of content become more significant. Farooq notes that technology integration requires not only technical readiness but also awareness of the broader implications of technological use (Farooq, 2025). The findings of the current study indicate that ethical and secure use of technology contributes directly to trust, participation, and acceptance of digital learning environments.

Another important aspect of the findings is the multidimensional nature of the identified model. The extracted dimensions were not isolated from one another; rather, they functioned as interconnected elements of a comprehensive classroom management system. For example, blended learning strengthened student preparation, which in turn facilitated active participation and improved classroom organization. Similarly, technological interaction supported collaborative learning and improved feedback processes, while learning analytics enhanced individualized assessment and instructional decision-making. This integrated structure reflects contemporary understandings of classroom management as a dynamic and interconnected educational process rather than a collection of separate classroom techniques.

The findings also highlight the unique relevance of technology-based classroom management in physical education. Unlike many theoretical disciplines, physical education combines cognitive learning with bodily movement, practical performance, and direct demonstration. Consequently, technology in this context serves not only informational functions but also visual, interactive, evaluative, and motivational purposes. Participants repeatedly referred to video-based movement review, practical exercise monitoring, digital collaboration, and performance analysis as valuable components of classroom management. This indicates that physical education classrooms may particularly benefit from technology-oriented management models because such tools directly support demonstration, repetition, correction, and performance observation.

Furthermore, the findings suggest that technology-based classroom management contributes to student-centered learning environments. Rather than relying exclusively on instructor-centered instruction, the identified dimensions encourage participation, self-regulation, collaborative learning, and independent engagement with educational content. Patel and Kim's work on differentiated instruction demonstrates the importance of adapting teaching practices to diverse learner needs (Patel & Kim, 2024). The present findings similarly suggest that technology enables greater flexibility and responsiveness to individual differences in physical education classrooms. Students can review content at their own pace, receive individualized feedback, participate through different communication channels, and engage with multimedia resources suited to their learning preferences.

Finally, the findings indicate that effective classroom management based on technological approaches requires not only technological tools but also pedagogical competence, organizational planning, emotional awareness, and ethical

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responsibility. Technology alone cannot improve classroom effectiveness unless it is integrated into a coherent educational framework. Teachers must therefore possess the ability to organize digital learning environments, maintain meaningful interaction, provide effective feedback, encourage participation, analyze educational data, and ensure ethical use of digital systems. In this regard, the identified model provides a comprehensive conceptual framework for understanding how technology can support classroom management in university-level physical education settings.

One limitation of the present study was that it focused exclusively on experts and university specialists associated with physical education at Wasit University, which may limit the transferability of findings to other educational contexts or academic disciplines. In addition, the study relied on qualitative interviews, meaning that the identified dimensions were based on participants' perceptions and experiences rather than quantitative measurement of classroom outcomes. Another limitation was the potential influence of contextual and infrastructural conditions specific to the university environment, including differences in internet access, technological resources, and institutional support. Furthermore, although theoretical saturation was achieved, a larger and more diverse participant group may have generated additional perspectives regarding technology-based classroom management.

Future research could examine the identified dimensions quantitatively in order to validate the proposed model and test the relationships among its components. Comparative studies across universities, educational levels, and academic disciplines may also provide deeper understanding of how technology-based classroom management varies in different contexts. Researchers may further investigate the effectiveness of specific technological tools such as artificial intelligence applications, gamified learning systems, virtual reality environments, or learning analytics platforms in improving classroom management outcomes in physical education. Longitudinal studies exploring the long-term effects of technology-based classroom management on student motivation, learning performance, practical skill development, and classroom engagement would also contribute significantly to the literature.

From a practical perspective, universities and educational institutions should provide instructors with professional development programs focused on technology-based classroom management strategies. Educational planners should improve technological infrastructure, including internet accessibility, learning management systems, multimedia facilities, and digital classroom equipment. Physical education instructors should be encouraged to integrate blended learning, digital assessment, collaborative online activities, and performance-monitoring tools into their instructional practices. In addition, educational institutions should develop ethical guidelines and security protocols to ensure responsible use of technology and protection of student information in digital learning environments.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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All procedures performed in studies involving human participants were under the ethical standards of the institutional and, or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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